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Shanghai SVA - NEC Liquid Crystal Display Co., Ltd.

TFT COLOR LCD MODULE

（ COMMON ）

SVA201VG01TB

51cm (20.1Type)

VGA

LVDS Interface (1port)

DATA SHEET

(Version 3.0)

Published by

Technology Department

SVA - NEC Liquid Crystal Display Co., Ltd.

Approved by	***Date***
Checked by	***Date***
Prepared by	***Date***

Signature of customer

Confirmed by	***Date***

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INTRODUCTION

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The specifications of maintenance parts may be partially changed within equivalent quality or better. In this product, SVA-NEC will not accept to maintain for only mounting parts on circuit board (e.g. connector, fuse, capacitor, resistor, etc.) and only backlight conformation parts (e.g. reflector sheet, light guide plate, etc.).

If SVA-NEC is planning discontinuation for this product, SVA-NEC shall inform it to customers in six (6)-months advance from the issued date of official agreements. In addition, after product discontinuation, SVA-NEC may replace substitutes instead of maintenance parts with whole product.

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For the purpose of product improvement, this product design may be changed for specifications, appearance, parts, circuits and so on. In case a design change is affected on the product specifications, SVA-NEC shall inform it to customers in advance.

• HANDLING OF DOUBTFUL POINTS

Any question arising out of, or in connection with, this SPECIFICATION or any matter not stipulated herein will be settled each time upon consultation between both parties.

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1. OUTLINE

1.1 STRUCTURE AND PRINCIPLE

SVA201VG01TB module is composed of the amorphous silicon thin film transistor liquid crystal display (a-Si TFT LCD) panel structure with driver LSIs for driving the TFT (Thin Film Transistor) array and a backlight.

The a-Si TFT LCD panel structure is injected liquid crystal material into a narrow gap between the TFT array glass substrate and a color-filter glass substrate.

Color (Red, Green, Blue) data signals from a host system (e.g. PC, signal generator, etc.) are modulated into best form for active matrix system by a signal processing board, and sent to the driver LSIs which drive the individual TFT arrays.

The TFT array as an electro-optical switch regulates the amount of transmitted light from the backlight assembly, when it is controlled by data signals. Color images are created by regulating the amount of transmitted light through the TFT array of red, green and blue dots.

1.2 APPLICATIONS

• Monitor for TV

1.3 FEATURES

• a-Si TFT active matrix
• LVDS interface
• R.G.B input 8bit, 16.77 millions colors (6bit+FRC)
• Resolution VGA:(640×480 pixels)
• Module size: 432(H) ×331.5(V) ×22 typ. (D)mm
• High response time (Ton+Toff=8 ms）
• High gamut: (against NTSC 72%typ.)
• Edge light type backlight (6 CCFL lamps)
• Inverter less

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2. GENERAL INFORMATION

Display area	408(H) x 306 (V) mm (typ.), [51 cm (20.1 inches)]
Drive system	a-Si TFT active matrix
Display color	16.77M colors (6bit+FRC)
Pixel	640 (H) x 480(V) pixels
Pixel arrangement	RGB (Red dot、Green dot、 Blue dot) vertical stripe
Pixel pitch	0.6375(W) x 0.6375 (H) mm
Module size	432.0±0.5(H) ×331.5±0.5 (V) ×22 typ.(D)mm
Weight	（3100）g (typ.)
Contrast ratio	450:1(typ.)
Viewing angle (At the contrast ratio 10：1)	• Horizontal: 140° (typ.) • Vertical: 130° (typ.)
Designed viewing direction	• Viewing angle with optimum grayscale (γ=2.2): normal axis
Color gamut	At LCD panel center 72 % (typ.) [against NTSC color space]
Response time	Ton (white 90%⟶ black 10%) + Toff (black 10%⟶ whjte 90%) 8 ms (typ.)
Luminance	At IBL = 6.5Arms / lamp (500)cd/m2(typ.)
Signal system	LVDS 1port [RGB :8-bit, Dot clock (CLK), Data enable (DE)]
Power supply voltage	LCD panel signal processing board：5.0V
Backlight	Edge light type：6 cold cathode fluorescent lamps (Inverter less)
Power consumption	At IBL=6.5Arms / lamp and checkered flag pattern （32）W (typ.)

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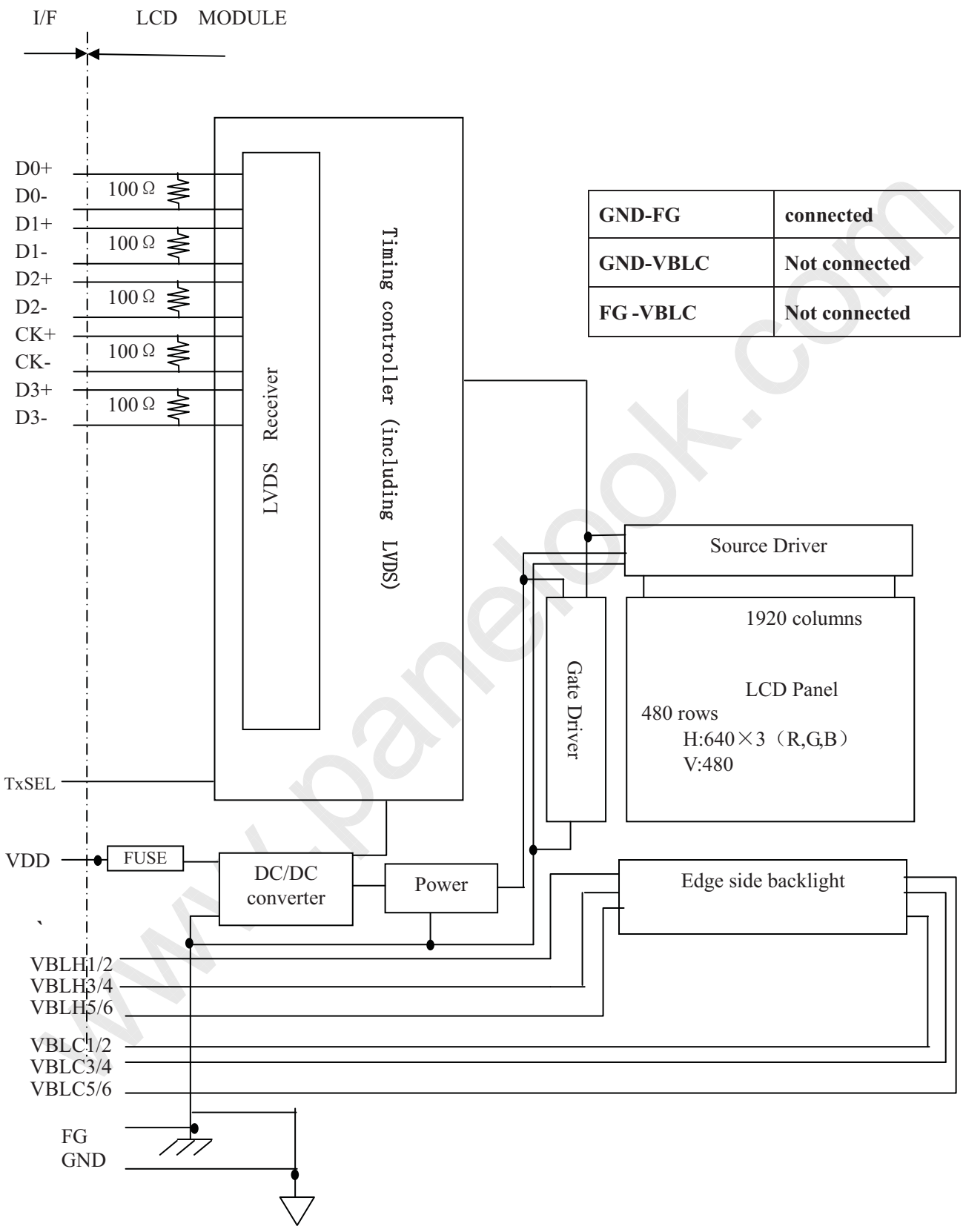
3. BLOCK DIAGRAM



GND-FG	**connected**
GND-VBLC	**Not connected**
FG -VBLC	**Not connected**

Note: System ground(GND), FG (Frame ground) in the product should be connected together in customer equipment.

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4. DETAILED SPECIFICATION

4.1 MECHANICAL SPECIFICATIONS

Parameter	Specification	Unit
Module size	432.0± 0.5 (W) × 331.5 ± 0.5 (H) × 22typ(D)	mm
Display area	408(H) x 306 (V) mm (typ.), [51 cm (20.1 inches)]	mm
Display dot number	640×3(H) ×480(V)	-
Pixel pitch	0.6375(H)×0.6375(V)	mm
Dot pitch	0.2125(H) ×0.6375(H)	mm
Color arrangement	RGB (Red dot、Green dot、 Blue dot) vertical stripe	-
Display color	16,777,216(6bit+FRC)	color
Weight	3100 (typ.), 3250 (max.)	g

4.2 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Rating	Unit	Remarks
Power supply voltage	Power voltage	VDD	-0.3 ~+6.0	V	Ta = 25°C
	Lamp voltage	VBLH	2000	Vrms	Ta = 25°C
Lamp current		IBL	（3.5）～（8.0）	mArms	Ta = 25°C,for each lamp
Lamp Oscillation frequency		FO	（40）～（80）	kHz	Ta = 25°C
Input voltage for signals	Display signals	VD	-0.3~ 3.3	V	Ta = 25°C Note1
	Function signals	VF		V	Ta = 25 °C Note2
Storage temperature		Tst	-20 ~ +60	°C	-
Operating temperature	Front surface	TopF	0 ~ +50	°C	Note3
	Rear surface	TopR	0 ~+55	°C	Note4
Relative humidity Note5		RH	≤95	%	Ta ≤40° C
			≤85		40° C < Ta≤50° C
Absolute humidity Note5		AH	≤70 Note6	g/m3	Ta > 50° C
Operating altitude		-	≤4, 850	m	0° C≤Ta≤55° C
Storage altitude		-	≤13, 600	m	-20° C≤Ta≤60° C

Note1: Display signals are DA0+/-, DA1+/-, DA2+/-, DA3+/-, CKA+/-, DB0+/-, DB1+/-, DB2+/-, DB3+/-,and CKB+/-.
Note2: TxSEL
Note3: Measured at center of LCD panel surface (including self-heat)
Note4: Measured at center of LCD module's rear shield surface (including self-heat)
Note5: No condensation
Note6: Ta = 50°C, RH = 85%

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4.3 ELECTRICAL CHARACTERISTICS

4.3.1 Driving for LCD panel signal processing board

(Ta=25°C)

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		VDD	4.5	5.0	5.5	V	-
Power supply current		IDD	-	TBD Note1	TBD Note2	mA	at VDD = 5.0V
Permissible ripple voltage		VRP	-	-	100	mV	VDD
Differential input threshold voltage for LVDS receiver	Low	VTL	-100	-	-	mV	at VCM = 1.2V Note3
	High	VTH	-	-	+100	mV	
Input voltage width for LVDS receiver		VI	0	-	2.4	V	-
Terminal resistor		RT	-	100	-	Ω	-
Input voltage for TxSEL signal	Low	VFL	-	-	1.0	V	TxSEL Note4
	High	VFH	Please keep open			V	
Input current for TxSEL signal		IFL	-160	-	-17	μA	

Note1: Checked flag pattern (EIAJ ED-2522)
Note2: Pattern for maximum current（2H1V dot inverse, 0/255 scale）
Note3: Common mode voltage for LVDS driver
Note4: TxSEL is inside pull-up signal (pull-up resistor :about 50KΩ)

4.3.2 Driving for backlight lamp

(Ta=25°C) Note1

Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Lamp voltage	VBLH	-	730	-	Vrms	Note2、Note3
Lamp current	IBL	3.5	6.5	8.0	mArms	Note3
Lamp starting voltage (discharge stabilization voltage)	Vs	1150	—	—	Vrms	Ta = 25℃ Note2、Note3
		1450	—	—	Vrms	Ta =0℃ Note2、Note3
Lamp oscillation frequency	FO	（40）	（58）	（80）	kHz	Note4

Note1: The backlight of this product is made up of 4-piece lamp. The specification above is only for one lamp.

Note2: The voltage timing cycle of each lamp should be set as the same phase. [Vs] and [VBLH] is the voltage between the high port and low port, the value is the characteristic of lamp. The starting voltage of inverter should be higher than the value. The possibility of not lighting exists by the lower voltage, so the suitable voltage should considered by the test .

Note3: The asymmetric ratio of working waveform for lamps (Lamp voltage peak ratio, Lamp current peak ratio and waveform area ratio) should be less than 5% (See the following figure). If the waveform is asymmetric, DC (Direct current) element applies into the lamp. In this case, a lamp lifetime may be shortened, because a distribution of a lamp enclosure substance inclines toward one side between low voltage terminal (Cold terminal) and high voltage terminal (Hot terminal).

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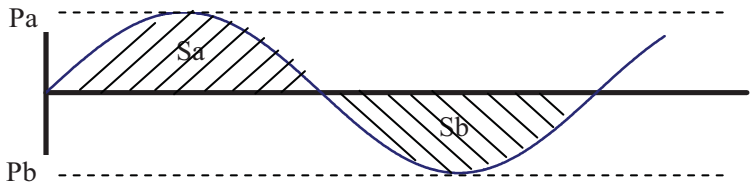


|Pa - Pb| / Pb × 100 ≤ 5%
|Sa - Sb| / Sb × 100 ≤ 5%

Pa: Supply voltage/current peak for positive, Pb: Supply voltage/current peak for negative
Sa: Waveform space for positive part, Sb: Waveform space for negative part

Note4: In case "FO" is not the recommended value, beat noise may display on the screen, because of interference between "FO" and "1/th". Recommended value of "FO" is as following.

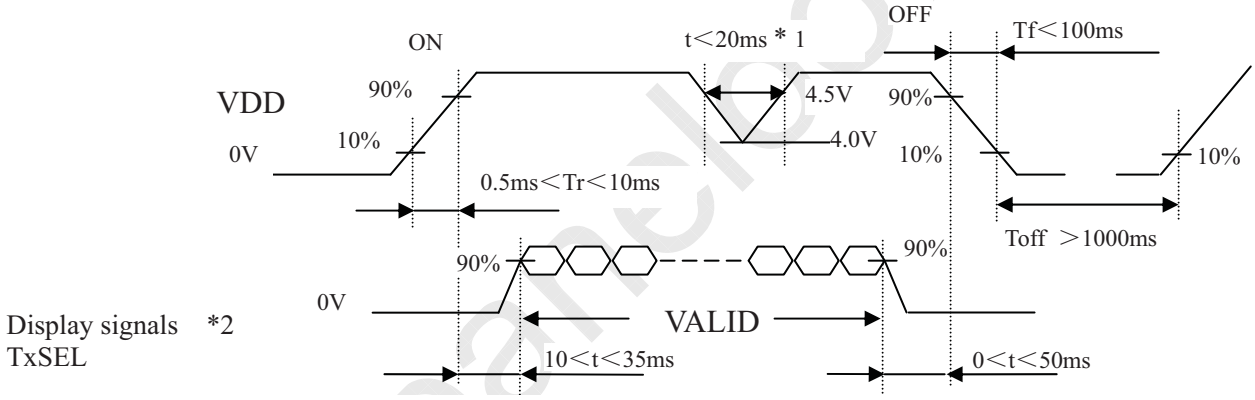
FO = 1/4 × 1/th × (2n-1)

Th: Horizontal signal period(See **"4. 8 .1 Timing characteristics".)**

n: Natural number (1, 2, 3 ……)

4.4 POWER SUPPLY VOLTAGE SEQUENCE AND RIPPLE

4.4.1 Power supply voltage sequence



*1. When VDD is on, but the value is lower than 4.5V, a protection circuit may work ,then the module may not display.

*2 The signal line is not connected with the module, at the end of cable the terminal resistor of 100Ω should be added.

Note1: Display signals (D0+/-, D1+/-, D2+/-, D3+/- and CK+/-) and function signal (MSL) must be "0" voltage, exclude the VALID period (See above sequence diagram). If these signals are higher than 0.3 V, the internal circuit is damaged.
If some of display and function signals (TxSEL) of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If customer stops the display and function signals (TxSEL), they should cut VDD.

Note2: When VDD is on, it should be set above 4.0V.

Note3: The backlight power supply voltage should be inputted within the valid period of display and function signals, in order to avoid unstable data display.

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4.4.2 Power supply voltage ripple

When the power supply is designed, the next form can give the reference. If the voltage ripple is over the value in next form, the noise should be seen in display area.

Ripple (Measured at input terminal of power supply)

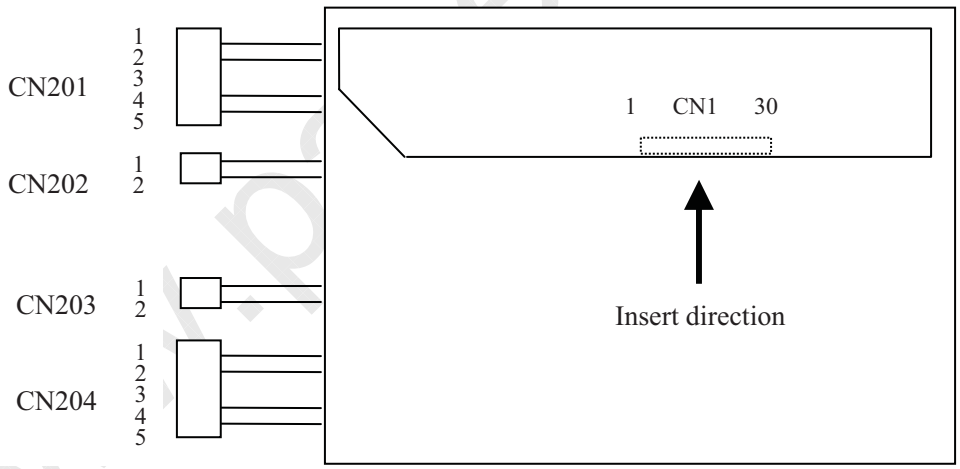
	VDD(5V to drive the panel)
Ripple voltage	≤100mVP-P（Including spike noise）

4.4.3 Fuse

Parameter	Fuse		Rating	Fusing current	Remarks
	Type	Supplier			
VDD（Logic）	FCC16501AB<TP>	KAMAYA	0.5 A 32 V	1A	Note1
VDD（Driving）	FCC16152AB<TP>	KAMAYA	1.5 A 32 V	3 A	

Note1: There are different logic and driving power supply system from the power input terminal. The power supply capacity should be above the fusing current. If the power supply capacity is less than the fusing current, the fuse may blow in a short time, and then nasty smell, smoking and so on may occur.

4.4.4 Connectors for power supply and signals



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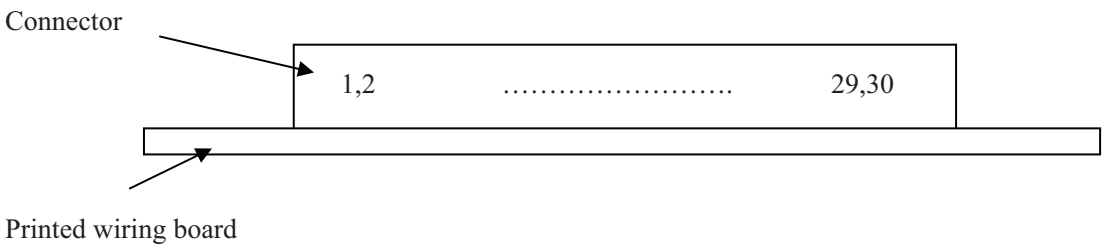
4.5 INTERFACE AND CONNECTOR PIN ALIGNMENT

CN1: FI-X30SSL-HF (Produced by JAE) <Adaptable connector: FI-X30C series or FI-X30H series or FI-X30M series (Produced by JAE), lock type is also adaptable.>

Pin No.	Symbol	Signal	Function
Frame	GND	Ground	Connect with the System GND
1	NC	-	Please keep it open
2	NC	-	Please keep it open
3	NC	-	Please keep it open
4	GND	Ground	Connect with the System GND
5	D0-	pixel data	pixel data input(LVDS level)
6	D0+	pixel data	pixel data input(LVDS level)
7	GND	Ground	System GND should be connected to the ground.
8	D1-	pixel data	pixel data input(LVDS level)
9	D1+	pixel data	pixel data input(LVDS level)
10	GND	Ground	System GND should be connected to the ground.
11	D2-	pixel data	pixel data input(LVDS level)
12	D2+	pixel data	pixel data input(LVDS level)
13	GND	Ground	System GND should be connected to the ground.
14	CLK-	pixel data	pixel data's clock input(LVDS level)
15	CLK+	pixel data	pixel data's clock input(LVDS level)
16	GND	Ground	System GND should be connected to the ground.
17	D3-	pixel data	pixel data input(LVDS level)
18	D3+	pixel data	pixel data input(LVDS level)
19	GND	Ground	System GND should be connected to the ground.
20	NC	-	Please keep it open
21	TxSEL	LVDS input format alternate	Open: A MODE System GND: B MODE (see "4.6 LVDS I/F DATA CHART")
22	NC	-	Please keep it open
23	GND	Ground	System GND should be connected to the ground.
24	GND	Ground	System GND should be connected to the ground.
25	GND	Ground	System GND should be connected to the ground.
26	VDD	Power supply	5V
27	VDD	Power supply	5V
28	VDD	Power supply	5V
29	VDD	Power supply	5V
30	VDD	Power supply	5V
Frame	GND	Ground	Connect with the System GND

CN1: The inserting side is as follows



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CN201: BHSR-05VS-1 (J.S.T Mfg. Co., Ltd.)
Adaptable connector: SM04(9-E2)B-BHS-1-TB (J.S.T.)

Pin No.	Signal name	Function
1	VH1	High voltage input terminal (1)for upper lamp(Cable color: Gray)
2	VH2	High voltage input terminal (2)for upper lamp(Cable color: Sky Blue)
3	NC	-
4	VL1	Low voltage input terminal (1)for lower lamp(Cable color: Black)
5	VL2	Low voltage input terminal(2) for lower lamp(Cable color: Dark Blue)

CN202: BHSR-02VS-1 (J.S.T Mfg. Co., Ltd.)
Adaptable connector: SM02B-BHSS-1-TB (J.S.T. Mfg Co., Ltd.)

Pin No.	Signal name	Function
1	VH3	High voltage input terminal(3) for upper lamp(Cable color: White)
2	VL3	Low voltage input terminal (3)for lower lamp(Cable color: White)

CN203 : BHR-05VS-1 (J.S.T Mfg. Co., Ltd.)
Adaptable connector: SM04(9-E2)B-BHS-1-TB (J.S.T.)

Pin No.	Symbol name	Function
1	VH4	High voltage input terminal (1)for lower lamp(Cable color: Gray
2	VH5	High voltage input terminal (2)for lower lamp(Cable color: Sky Blue)
3	NC	-
4	VL4	Low voltage input terminal (1)for lower lamp(Cable color: Black)
5	VL5	Low voltage input terminal(2)for lower lamp(Cable color: Dark blue)

CN204: BHSR-02VS-1 (J.S.T Mfg. Co., Ltd.)
Adaptable connector: SM02B-BHSS-1-TB (J.S.T. Mfg Co., Ltd.)

Pin No.	Symbol name	Function
1	VH6	High voltage input terminal for lower lamp(Cable color: White)
2	VL6	Low voltage input terminal for lower lamp(Cable color: White)

Note1: The ports of VDD and GND should be all used. As for the input of LVDS, please use the twisted pair wire of the transmission impedance 100Ω.

Note2: System ground(GND), FG (Frame ground) and VBLC (Lamp low voltage terminal) in the product should be connected together in customer equipment.

This product uses CN1 21 pin (Terminal name: MSL), the following two modes of LVDS input map can be selected.

Pin No.	Symbol	Signal name	Function
21	RxBSEL	LVDS input MAP select	Input MAP alternate(TTL level) "Open" : Input map LDI mode "Low" : Input map NEC mode

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4.6 LVDS I/F DATA CHART

Input DATA		Transmitter THC63LVDM83A		I/F CN		Controller	
				Pin	CN1	Pin	CN1
pixel data and control signals	R2	TA0					
	R3	TA1					
	R4	TA2					
	R5	TA3					
	R6	TA4	TA-	5	D0-	8	RA_N
	R7	TA5	TA+	6	D0+	9	RA_P
	G2	TA6					
			TB-	8	D1-	10	RB_N
	G3	TB0	TB+	9	D1+	11	RB_P
	G4	TB1					
	G5	TB2	TC-	11	D2-	13	RC_N
	G6	TB3	TC+	12	D2+	14	RC_P
	G7	TB4					
	B2	TB5	TCLK-	14	CLK-	15	RCLK_N
	B3	TB6	TCLK+	15	CLK+	16	RCLK_P
	B4	TC0	TD-	17	D3-	17	RD_N
	B5	TC1	TD+	18	D3+	18	RD_P
	B6	TC2					
	B7	TC3					
	RSVD	TC4					
	RSVD	TC5					
	DE	TC6					
	R0	TD0					
	R1	TD1					
	G0	TD2					
	G1	TD3					
	B0	TD4					
	B1	TD5					
	RSVD	TD6					
	CLK	CLKIN					

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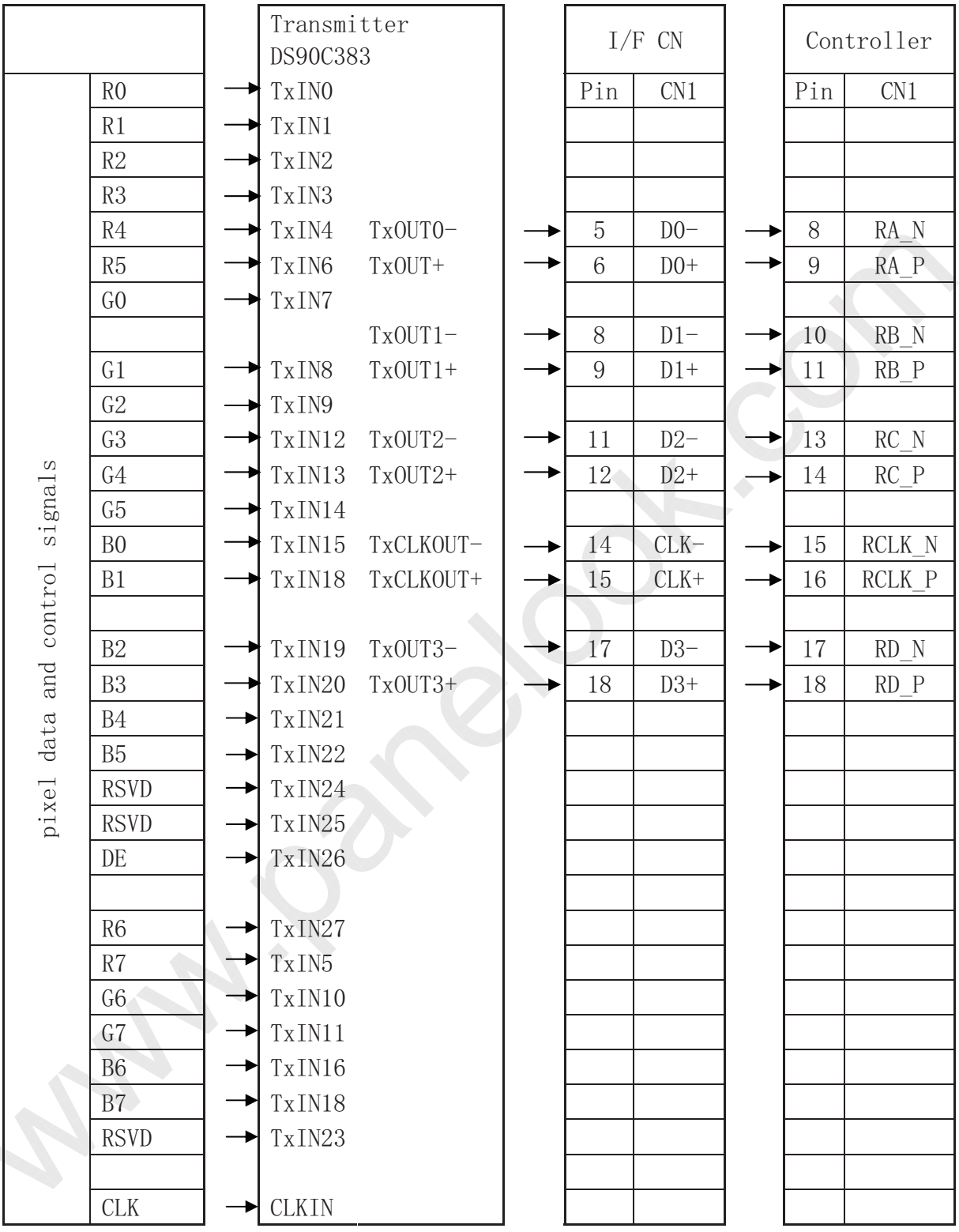

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4.7 DISPLAY COLORS AND INPUT DATA SIGNALS

This product can display in equivalent to 16,777,216 colors in 256 scale. Also the relation between display colors and input data signals is as the following table.

Display colors		Data signal（0:Low level 、1:High Level）																							
		RA7	RA6	RA5	RA4	RA3	RA2	RA1	RA0	GA7	GA6	GA5	GA4	GA3	GA2	GA1	GA0	BA7	BA6	BA5	BA4	BA3	BA2	BA1	BA0
		RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0	GB7	GB6	GB5	GB4	GB3	GB2	GB1	GB0	BB7	BB6	BB5	BB4	BB3	BB2	BB1	BB0
Basic color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑				:								:								:				
	↓				:								:								:				
	Bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	↑				:								:								:				
	↓				:								:								:				
	Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Bule scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	↑				:								:								:				
	↓				:								:								:				
	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note: Combination with 8 bit(256 grayscale) R,G,B color signal , the color can be formed.

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4.8 INTERFACE TIMING

4.8.1 Timing specification

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Clock	Frequency	1/tc	18	19.75	30	MHz	LVDS transmitter input
		tc	33.33	50.63	55.56	ns	
	Rise time, Fall time	-	Refer to the timing characteristics of LVDS transmitter			ns	-
	Duty	-				-	-
Horizontal signals	Cycle	th	26.33	40.51	47.22	μs	25.0kHz(typ.)
			790	800	850	CLK	
	Display period	thd	640			CLK	-
Vertical signals	Cycle	tv	15.87	20.13	21.28	ms	50.0Hz(typ.)
			490	500	560	H	
	Display period	tvd	480			H	-
DE/Data	Setup time	-	Refer to the timing characteristics of LVDS transmitter			ns	-
	Hold time	-				ns	-
	Rise time, Fall time	-				ns	-

Note: It is suggested that the cycle of horizontal signals fluctuate in the range of ±10CLK。In case go beyond that range, probably the false action would happen to the loop .

For example, in case the cycle of horizontal signals is 800CLK,the allowable fluctuation range is 790~810CLK.

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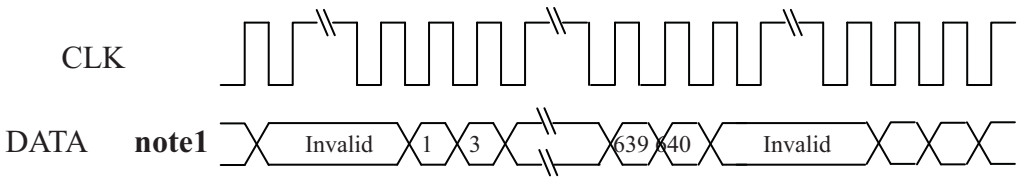
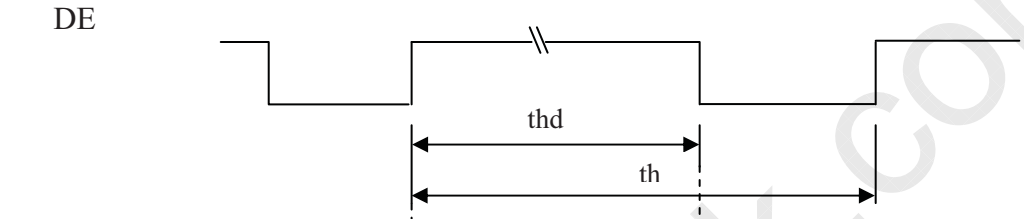
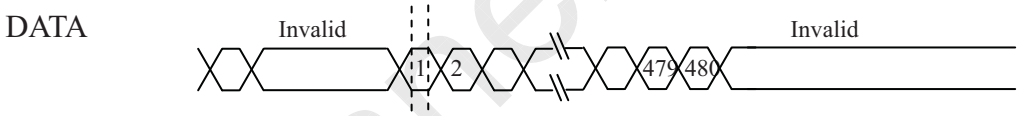
4.8.2 Input signal timing chart

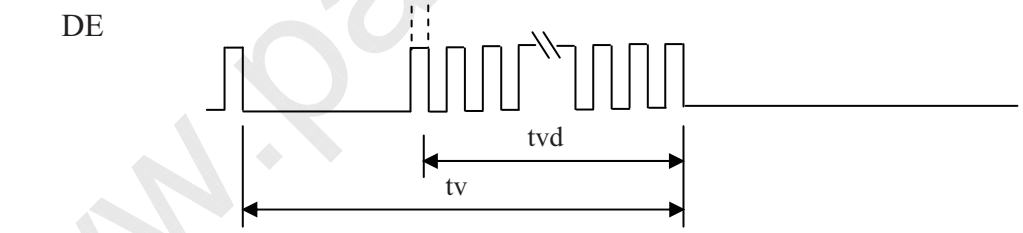
Horizontal timing





Vertical timing





Note 1: DATA=R0-R7,G0-G7,B0-B7

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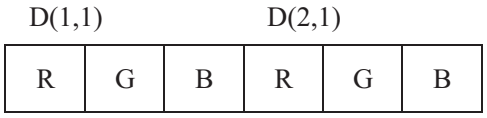
4.8.3 Pixel DATA alignment of display image

The following chart is the coordinates of per pixel

Pixel: R= R DATA

G= G DATA

B= B DATA



D(1,1)	D(2,1)	D(3,1)	•••	D(640,1)
D(1,2)	D(2,2)	D(3,2)	•••	D(640,2)
D(1,3)	D(2,3)	D(3,3)	•••	D(640,3)
•	•	•	•••	•
•	•	•	•••	•
•	•	•	•••	•
D(1,480)	D(2,480)	D(3,480)	•••	D(640,480)

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4.9 OPTICS

4.9.1 Optical characteristics

Note1 ,Note2

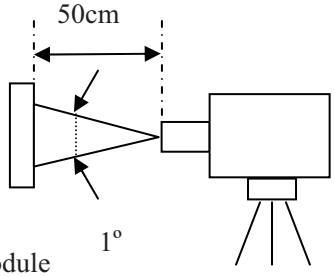
Parameter Note1		Condition	Symbol	min.	typ.	max.	Unit	Remarks
Luminance		White at center θR=0°, θL=0°, θU=0°, θD=0°	L	TBD	(480)	-	cd/ m^2	-
Contrast ratio		White/Black at center θR=0°, θL=0°, θU=0°, θD=0°	CR	TBD	(450)	-	-	Note3
Luminance uniformity		White θR=0°, θL=0°, θU=0°, θD=0	LU	-	1.2	1.3	-	Note4
Chromaticity	White	X coordinate	Wx	TBD	0.295	TBD	-	Note5
		Y coordinate	Wy	TBD	0.293	TBD	-	
	Red	X coordinate	Rx	TBD	TBD	TBD	-	
		Y coordinate	Ry	TBD	TBD	TBD		
	Green	X coordinate	Gx	TBD	TBD	TBD		
		Y coordinate	Gy	TBD	TBD	TBD		
	Blue	X coordinate	Bx	TBD	TBD	TBD		
		Y coordinate	By	TBD	TBD	TBD		
Color gamut		θR=0°, θL=0°, θU=0°, θD=0 At center,against NTSC	C	TBD	72	-	%	
Response time		White to black	Ton	-	TBD	TBD	ms	Note6 Note7
		Black to white	Toff	-	TBD	TBD	ms	
		Ton+ Toff	-	-	8	TBD	ms	
Viewing angle	Right	θU=0°, θD=0°,CR=10	θR	TBD	(70)	-	°	Note8
	Left	θU=0°, θD=0°,CR=10	θL	TBD	(70)	-	°	
	Up	θR=0°, θL=0°,CR=10	θU	TBD	(70)	-	°	
	Down	θR=0°, θL=0°,CR=10	θD	TBD	(60)	-	°	

Note1: The values in upper table are only initial characteristics.

Note2: Measurement conditions are as follows.

Ta=25°C，VDD=5.0V，IBL=6.5mArms/lamp，Display mode：VGA，Horizontal cycle=25.0KHz，Vertical cycle=50.0Hz

Optical characteristics are measured at luminance saturation after 20minutes from working the product in the dark room. Also measurement method for luminance is as follows.



LCD module
(Product)

Luminance Meter (TOPCON BM-5A)
Spectroradiometer(TOPCON SR-3)

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Note 3: See**"4.9.2 Definition of contrast ratio".**
Note 4: See**"4.9.3 Definition of luminance uniformity".**
Note 5: CIE 1931 Chromaticity Diagram Standard.
Note 6: Product surface temperature: TopF = TBD ℃
Note 7: See **"4.9.4 Definition of response times".**
Note 8: See **"4.9.5 Definition of viewing angles".**

4.9.2 Definition of contrast ratio

The contrast ratio is calculated by using the following formula.

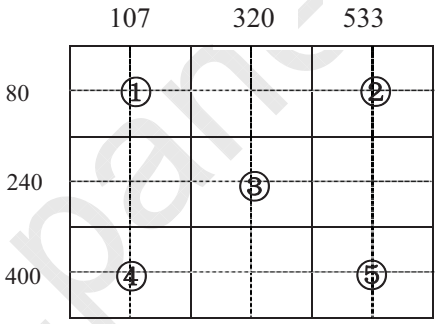
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance of white screen}}{\text{Luminance of black screen}}$$

4.9.3 Definition of luminance uniformity

The luminance uniformity is calculated by using the following formula.

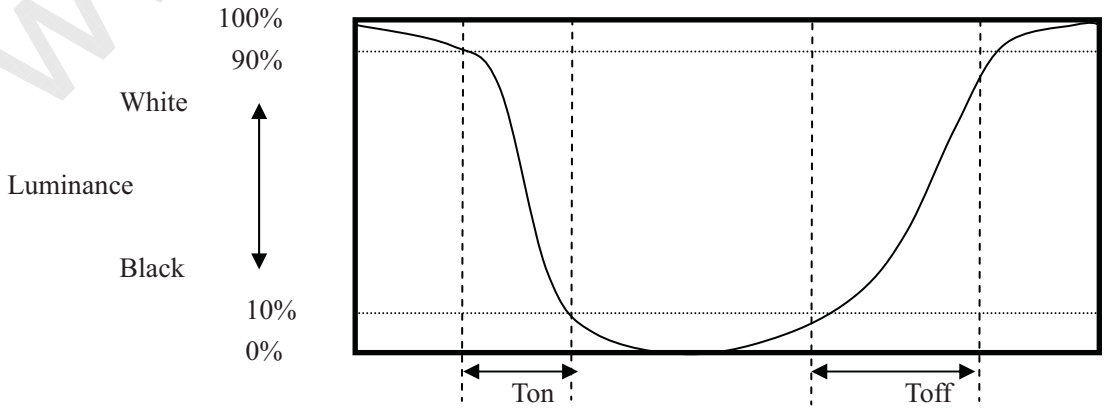
$$\text{Luminance uniformity (LU)} = \frac{\text{Maximum luminance from ① to ⑤}}{\text{Minimum luminance from ① to ⑤}}$$

The luminance is measured at near the 5 points shown below.



4.9.4 Definition of response times

Response time is measured, the luminance changes from "white" to "black", or "black" to "white" on the same screen point, by photo-detector. Ton is the time it takes the luminance change from 90% down to 10%. Also Toff is the time it takes the luminance change from 10% up to 90%. (See the following diagram.)



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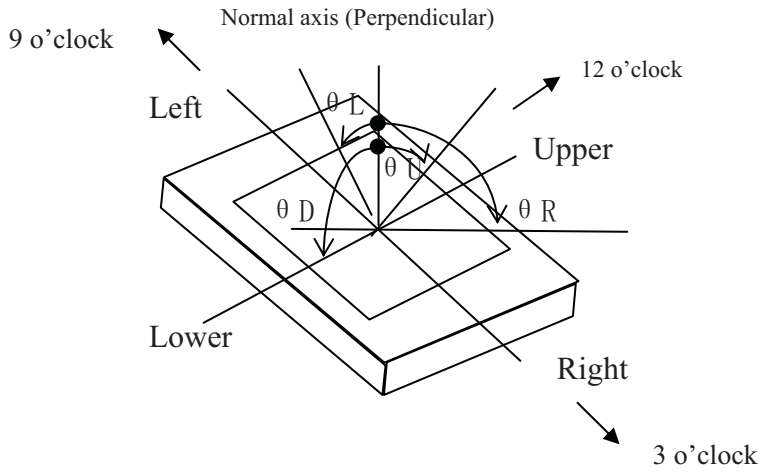
4.9.5 Definition of viewing angle



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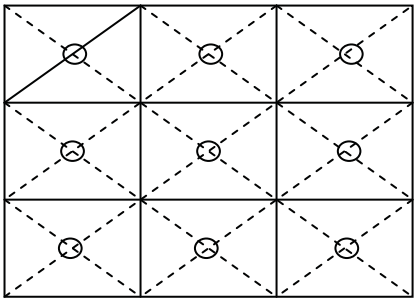
5. RELIABILITY TESTS

Test items		Condition
High temperature and humidity(Operation)		① 50±2℃,RH=85%,240hours ② Normal temperature and humidity,1~24hours ③ Display data is black **Note1**
Heat cycle (Operation)		① 0±3℃...1hour 55±3℃...1hour ② 50cycles,4hours/cycle ③ Display data is black
Thermal shock (Non operation)		① -20±3℃...30minutes 60±3℃ ...30minutes ② 100cycles,1hour/cycle ③ Temperature transition time is within 5 minutes.
ESD (operation)		① 150Pf,150Ω,±10kV ② 9 places on a panel surface ③10 times each place at 1 sec interval **Note2**
Dust (operation)		① Sample dust: No.15(byJIS-Z8901) ② 15 seconds stir ③ 8 times repeat at 1 hour interval
Vibration (Non operation)		① 5-100Hz，acceleration of 11.76m/S^2 ② 1 minutes/cycle ③ X,Y,Z direction ④ 10 times each direction
Mechanical shock (Non operation)		① 294m/S^2， 11ms ② ±X，±Y，±Z direction ③ 3 times each direction
Low pressure	operation	①53.3kPa (Equivalent to altitude 4,850m） ② 0℃±3℃...24hours ③ 55℃±3℃...24hours
	non-operation	① 15kPa (Equivalent to altitude 13,600m） ② -20℃±3℃...24hours ③ 60℃±3℃... 24hours

Note1: Display and appearance are checked under environmental conditions equivalent to the inspection conditions of defect criteria.

Note2: See the following figure for discharge points.



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6. ESTIMATED LUMINANCE LIFETIME

The luminance lifetime is the time from initial luminance to half-luminance.

This lifetime is the estimated value, and is not guarantee value.

Condition		Luminance lifetime(MTTF) **Note1**	Unit
Cold cathode Fluorescent lamp,**Note2**	(Ambient temperature of the product) Continuous operation Luminance(max) and IBL=6.5mArms/lamp	50000h(min) TBDh(typ)	h

Note1: MTTF is mean time to half-luminance. In case the product works under low temperature environment, the lifetime becomes short.

Note2: This is reference data. This is the CCFL lifetime, not the lifetime of LCD module.

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7.PRECAUTIONS

7.1 MEANING OF CUTION SIGNS

The following caution signs have very important meaning .**Be sure to read "10.2 CAUTIONS" and "10.3 ATTENTIONS", after understanding these contents!**

This sign have the meaning that customer will be injured by himself or the product will sustain a damage, if customer has wrong operations.

This sign has the meaning that customer will get an electrical shock, if customer has wrong operations.

This sign has the meaning that customer will be injured by himself, if customer has wrong operations.

7.2 CAUTIONS 

*** Do not touch lamp cables while turn on .Customers will be in danger of an electric shock**

*** Do not touch the working backlight and IC. Customers will be in danger of burn injury.**
*** Do not shock and press the LCD panel and the backlight! There is a danger of breaking, because they are made of glass.(shock :To be not greater 294m/s^2 and to be not greater 11ms, Pressure: To be not greater 19.6N)**

7.3 ATTENTIONS

7.3.1 Handling of the product

① Take hold of both ends without touch the circuit board when customer pulls out products (LCD modules) from inner packing box. If customer touches it, products may be broken down or out of adjustment, because of stress to mounting parts.

② Do not hook cables nor pull connection cables such as flexible cable and so on , for fear of damage.

③ If customer puts down the product temporarily, the product puts on flat subsoil as a display side turns down.

④ Take the measures of electrostatic discharge such as earth band, ionic shower and so on, when customer deal with the product, because products may be damaged by electrostatic.

⑤The torque for mounting screws must never exceed 0.34N-m. Higher torque values might result in distortion of the bezel.

⑥The product must be installed using mounting holes without undue stress such as bends or twist (See outline drawings).And do not add undue stress to any portion (such as bezel flat area) except mounting hole portion.
Bends or twist described above and undue stress to any portion except mounting hole portion may cause display

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un-uniformity.

⑦Do not press or rub on the sensitive display surface .If customer clean on the panel surface, SVA-NEC recommends using the cloth with ethanolic liquid such as screen cleaner for LCD.

⑧ Do not push-pull the interface connectors while the product is working, because wrong power sequence may break down the product.

⑨ Do not bend or unbend the lamp cable at the near part of the lamp holding rubber, to avoid the damage for high voltage side of the lamp. This damage may cause a lamp breaking and abnormal operation of high voltage circuit.

7.3.2 Environment

① Do not operate or store in high temperature, high humidity, dewdrop atmosphere or corrosive gases. Keep the product in antistatic pouch in room temperature, because of avoidance for dusts and sunlight, if customer stores the product.

② In order to prevent dew condensation occurring by temperature difference, the product packing box must be opened after leave under the environment of an unpacking room temperature enough. Because a situation of dew condensation occurring is changed by the environment temperature and humidity, evaluate the leaving time sufficiently. (Recommendation leaving time: 6 hour or more with packing state)

③ Do not operate in a high magnetic field .Circuit boards may be broken down by it.

④ This product is not designed as radiation hardened.

⑤ Use an original protection sheet on the product surface (polarizer). Adhesive type protection sheet should be avoided, because it may change color or properties of the polarizer.

7.3.3 Characteristics

The following items are neither defects nor failures.

① Response time, luminance and color may be changed by ambient temperature.

②The LCD may be seemed luminance non-uniformity, flicker, vertical seam or small spot by display patterns.

③Optical characteristics (e.g. luminance, display uniformity, etc.) gradually is going to change depending on operating time ,and especially low temperature, because the LCD has cold cathode fluorescent lamps.

④Do not display the fixed pattern for a long time because it may cause image sticking .Use a screen saver, if the fixed pattern is displayed on the screen.

⑤The display color may be changed by viewing angle because of the use of condenser sheet in the backlight.

⑥Optical characteristics may be changed by input signal timings.

⑦The interference noise of input signal frequency for this product and luminance control frequency of customer's backlight inverter may appear on a display. Set up luminance control frequency of backlight inverter so that the interference noise doses not appear.

7.3.4 Other

①All GND and VCC terminals should be used without a non-connected line.

②Do not disassemble a product or adjust volume without permission of SVA-NEC.

③See "REPLACEMENT MANUAL FOR LAMPHOLDER SET", if customer would like to replace backlight lamps.

④Pay attention not to insert waste materials inside of products, if customer uses screw nails.

⑤Pack the product with original shipping package, because of avoidance of some damages during transportation, when customer returns it to SVA-NEC for repair and so on .

⑥Not only the module but also the equipment should be packed and transported as the module. becomes vertical .Otherwise, there is the fear that a display dignity decreases by an impact or vibrations.

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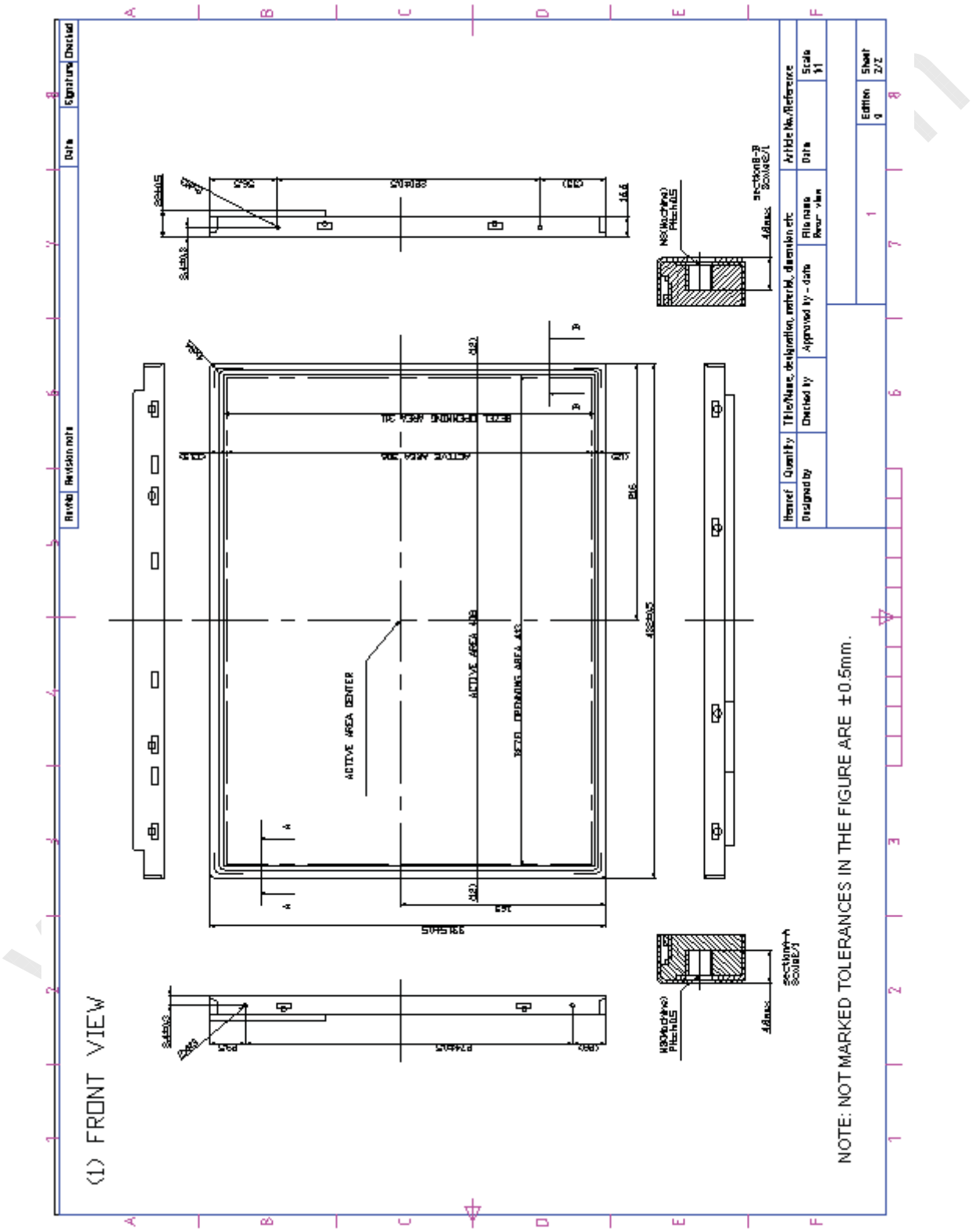
8. OUTDRAWING

8.1 FRONT VIEW



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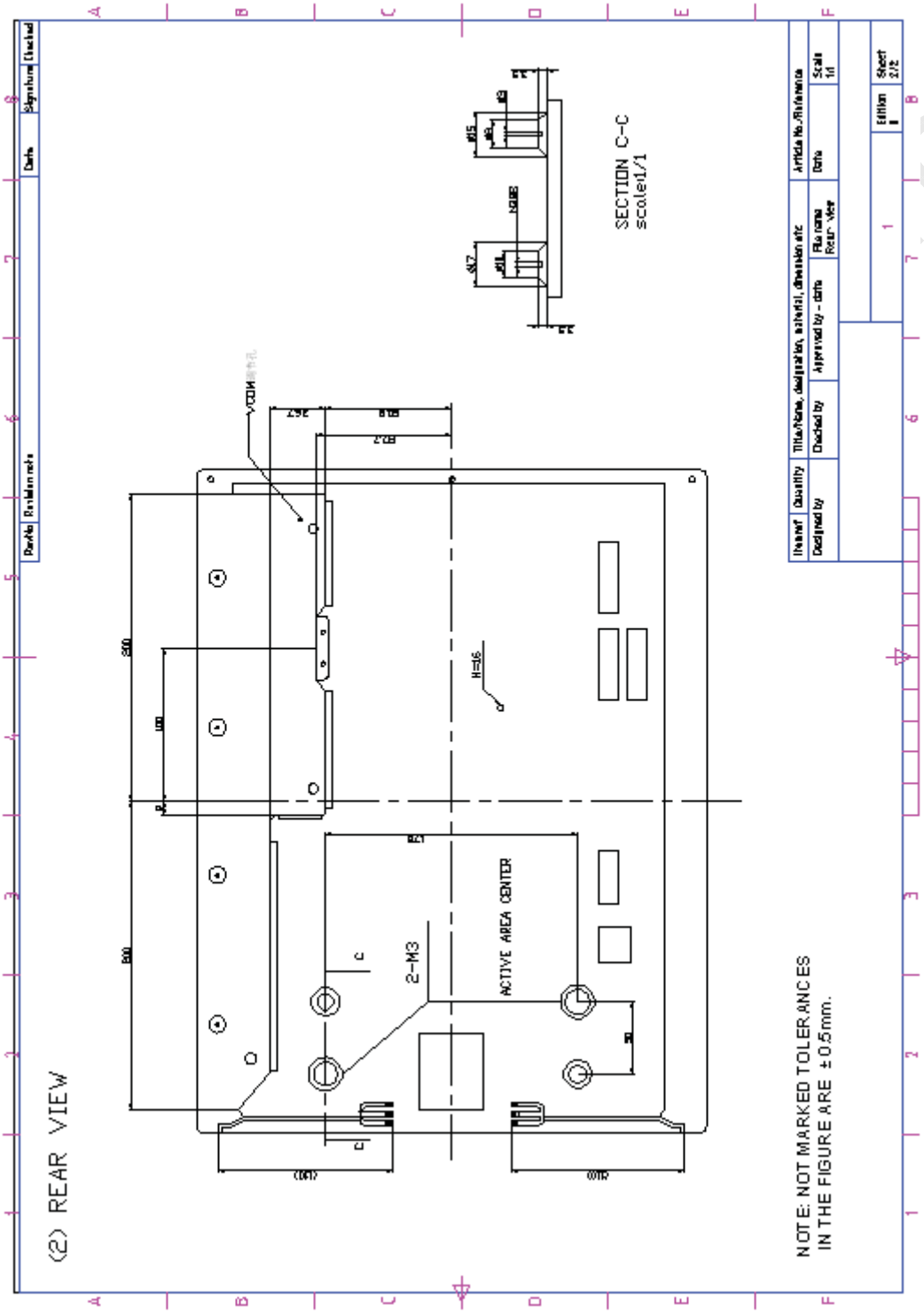
8.2 REAR VIEW



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Rev	Revised date	Main Revision item and sign	Approved by	Checked by	Prepared by	Published date
1.0		sign: 品 营 / 武 孙 / 定 亚 / 雄 伟	木下	甲斐	Shu Bingxian	2006-4-19
2.0		sign: 品 营 / 武 孙 / 定 亚 / 雄 伟 1.Luminance has renewed(P5) 2. Fuse parameter was added(P10) 3. Lamp voltage, Lamp current, Lamp starting voltage, Lamp oscillation frequency was added(P8) 4. Lamp Oscillation frequency was added(P7)	木下	甲斐	Shu Bingxian	2006-4-27
3.0		sign: 品 营 1.Weight for LCD panel was renewed.(p5-p6) 2.Absolute maximum ratings and driving for backlight lamp was renewed(p7-p8)			Shu Bingxian 2006-5-28	

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